⑲ Europäisches Patentamt
European Patent Office
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⑪ Publication number: **0 446 020 B1**

⑫ **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication of patent specification: **25.01.95**

(51) Int. Cl.6: **A61B 17/32**, A61B 17/28, A61B 17/22

㉑ Application number: **91301829.7**

㉒ Date of filing: **05.03.91**

(54) **Surgical gripping instrument.**

㉚ Priority: **05.03.90 US 489472**

(43) Date of publication of application:
11.09.91 Bulletin 91/37

(45) Publication of the grant of the patent:
25.01.95 Bulletin 95/04

(84) Designated Contracting States:
BE DE ES FR GB IT NL

(56) References cited:

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Description

This invention relates to surgical gripping instruments of the type which are introduced into body cavities and manually operated to grasp a portion of the patient's tissue.

Manually operable surgical gripping instruments are well known (see US-A-3 955 578). Typically, the gripping elements located at the distal end of the instrument are operated by movement of a wire or cable manipulated by the surgeon at the proximal end of the instrument. Very often, such instruments comprise a support assembly which includes a thumb hole and a slide which includes a finger grip and is movable with respect to the support assembly. The gripping instrument may be enclosed by a sheath such that when the wire pulls the gripping instrument into the sheath, the gripping instrument is actuated to grasp the tissue. Such gripping instruments are used for purposes such as bronchoscopy, bulboscopy, colonoscopy, duodenoscopy, endoscopy and gastroscopy.

In some situations, relatively substantial movement of the slide with respect to the support assembly is necessary to actuate the gripping instrument. For example, in the case of a polypectomy snare used to surgically remove polyps from the colon, it may be necessary to move the slide relative to the support assembly as much as three and a half inches. This movement, known as the "throw" of the instrument, is very often uncomfortable for the surgeon and sometimes two hands are needed to operate the device.

The problem underlying the invention is to provide a surgical gripping instrument of the type described wherein the throw required to actuate the instrument is reduced.

Preferably, the surgical gripping instrument should be cost efficient to manufacture as a disposable device, be easier to use than comparable devices by virtue of the reduced throw required to actuate the gripping device, but be similar in appearance and construction to known surgical instruments of this type.

Briefly, in accordance with the invention, the problem is solved in a surgical instrument comprising a support assembly, a slide movable with respect to the support assembly, a sheath and a wire passing through the sheath, and the instrument including gripping means at the distal end of the wire actuated when the wire is moved a predetermined distance relative to the sheath, by providing an increase in the mechanical advantage of the device so that the displacement of the slide relative to the support assembly required to actuate the gripping device is substantially less than such predetermined distance.

In accordance with the illustrated embodiments, the actuating wire may be coupled to the slide and the sheath may be movable or it may be fixed to the support assembly. In a preferred embodiment, the sheath is movable and a belt secured to the sheath and slide causes the sheath to move in a direction opposite the direction of movement of the wire when the slide is moved. In other embodiments, gear means provide the desired mechanical advantage.

The foregoing and other features of the present invention will be more readily apparent from the following detailed description of the accompanying drawings of illustrative embodiments of the invention in which:

Figure 1 is a perspective view of a preferred embodiment of the invention showing the snare loop unsheathed;

Figure 2 is a top view, partly in section, of the embodiment shown in Figure 1 with the snare within the sheath;

Figure 3 is an enlarged side sectional view along the line 3-3 of Figure 2;

Figure 4 is an enlarged side sectional view showing the snare unsheathed;

Figure 5 is a sectional view along line 5-5 of Figure 4;

Figure 6 is a top view in section of a second embodiment of the invention;

Figure 7 is a sectional view along line 7-7 in Figure 6;

Figure 8 is a top view in section of a third embodiment of the invention; and

Figure 9 is a top view in section of a fourth embodiment of the invention.

Referring first to Figures 1 to 5, as shown in Figure 1, a surgical gripping instrument according to the invention has, as a first component, a support assembly 10 which includes a proximal thumb ring 12 and rails 14. Rails 14 are separated by a groove and connected at their proximal ends by thumb ring 12 and at their distal ends by an integrally formed front piece 15. Rails 14 are crescent-shaped in cross-section (Figure 5). Distal and proximal axles 16 and 18 (Figure 3) are transversely mounted in support assembly 10.

As a second component, a bifurcated slide 30 is slidably positioned on rails 14. Slide 30 comprises two finger rings 32, an annular body 33, and an elongated tongue 34 which extends beneath rails 14 (see Figure 4). The interior of annular body 33 matches the cross-sectional area of rails 14 which thereby permits longitudinal movement of slide 30 relative to support assembly 10 between end cap 15 and thumb ring 12.

The third component is a wire assembly 50 comprising rod 51, connector section 55 of rod 51 (Figure 2) which connects rod 51 to a wire or cable

53, and connector 57 which connects wire 53 to a loop snare 59 at its distal end. Snare 59 is shown in Figure 1 in an open or unsheathed position. A sheath 60 envelops wire 53 and snare 59 except when wire 53 is in an extended position to open snare 59 into a loop as shown in Figures 1 and 4.

As shown in Figures 2 to 4, the proximal end of sheath 60 is secured to a block 70. Since block 70 is secured to sheath 60, longitudinal movement of block 70 between rails 14 will also cause the same longitudinal movement of sheath 60. Similarly, since rod 51 is secured to slide 30, longitudinal movement of slide 30 will cause the same movement of rod 51.

As shown in Figures 1 and 2, rod 51 extends through an aperture in front piece 15 and between the rails 14 through mounting block 70. Rod 51 is received within a bore (not numbered) in block 70 for axial movement with respect thereto. Rod 51 is not enclosed by sheath 60 and extends between rails 14 into annular body 33 where it is secured by connector 62. Connector 62 passes through so much of body 33 as needed to secure rod 51 within the slide 30. The internal diameter of sheath 60 is sized to enable rod 51, wire 53, snare 59 and connectors 55 and 57 substantially free longitudinal movement along its entire length.

Figure 3 is an enlarged sectional view along lines 3-3 of Figure 2 and shows a belt 80 which extends around the proximal axle 18, through block 70 in which it is securely fixed, and around distal axle 16. Tongue 34 which is a part of slide 30, extends from finger ring annular body 33 along the underside of rails 14 as shown in Figures 1 and 4. At the distal end of tongue 34, there is a heat seal pin 36 on to which is mounted the perforated ends of belt 80 as shown in Figure 3. Belt 80 is thereby connected to slide 30 and is secured thereto by heating heat seal pin 36 to form a head as shown. Belt 80 may be fixed to block 70 (Fig. 3) by overmoulding the block to the belt.

To operate the device shown in Figures 1 to 5, the user grasps the thumb ring 12 and finger holes 32 and pulls the slide 30 to the proximal end of the support assembly 10. In this position, the snare 59 is retracted within sheath 60 as shown in Figure 3.

As is conventional, in one application of the invention, the surgeon inserts the distal end of the sheath 60 into the patient's colon until the polyp is located. Using one hand, the surgeon can then move the slide to the distal end of the support assembly which simultaneously causes the sheath 60 to be pulled toward the proximal end of the instrument and the wire assembly 51, 53 and 59 to be pushed toward the distal end of the instrument. This exposes and opens the snare 59 so that it can be used to snare the patient's polyp. If, for example, three inches of movement of the gripping means relative to the sheath are required to fully unsheath the snare 59, with the surgical instrument shown in Figures 1 to 5, it is only necessary for the surgeon to move the slide 1.5 inches relative to the support assembly.

When the snare has been positioned around the polyp to be removed, the surgeon then pulls the slide back toward the distal end of the support assembly. This causes the slide to pull the wire assembly and snare 59 toward the proximal end of the instrument while, at the same time, the sheath 60 is pushed toward the distal end, causing the snare to close around the polyp. Again, the movement of the slide relative to the support assembly necessary to cause the snare to be retracted is one-half the movement of the snare relative to the sheath. Hence, even if displacement of the snare relative to the sheath is in the order of four inches, the surgeon need move the slide relative to the support assembly only two inches which is a relatively simple matter.

Although the preferred embodiment of the present invention has been described as a snare, the principles of the invention are applicable to other surgical gripping devices such as grasping forceps, biopsy forceps, retrieval baskets, mechanical lithotriptors, etc. Furthermore, remote electrostimulation, cauterization, or other electromechanical operations or procedures can be accomplished at the gripping end of the device if the sheath is made of an electrical insulating material, the wire cable, rod, and electrical connector 62 are made of electrical conductive materials, and an external electrical connector of a power source, a instrument or a measuring device is attached to connector 62 (Figure 1).

Figures 6, 7, 8 and 9 show three additional embodiments of the invention in which gears are used to provide the mechanical advantage for reducing the throw of the device. With respect to these embodiments, the devices are shown schematically. In each case, as in the case of the embodiment of Figures 1 to 5, the rod which is attached to the snare or other gripping means is shown at 51 and the sheath at 60. The support assembly is shown at 100 terminating in a thumb ring 102. The support assembly 100 includes two rails 104 and 106 on which a slide 108 is adapted to move longitudinally (axially). The slide includes finger rings 110 so that the user can move the slide 108 relative to the support assembly 100 by grasping in one hand the finger holes 110 and the thumb hole 102.

In the embodiment shown in Figures 6 and 7, the wire rod 51 is secured to the slide 108 and moves with it. A cap 116 is secured to the sheath 60 and arranged for axial, slidable movement with respect to the slide 108. Two pinions 118 and 120 are rotatably supported within the slide 108 (see Figure 7) and engage, respectively, rack 122 on the sheath cap 116 and rack 124 on the upper surface of rail 104.

Depending on the diameters of the pinions 118 and 120, as the slide 108 is moved relative to the support assembly 100, the wire is moved in one direction and the sheath in the other direction. As one example, the sizes of the pinions 118 and 120 may be selected so that the relative displacement of the slide to the support assembly is one half that of the sheath 60 relative to the rod (and snare) 51. In the embodiment of Figures 6 and 7, as the slide is pulled proximally toward the thumb ring 102, the wire 51 is pulled in the same direction causing it to be retracted into the sheath. Simultaneously, this proximal movement of slide 108 rotates pinion 120 clockwise causing pinion 118 to rotate counterclockwise and the cap 116 to move in a distal direction, thereby advancing the sheath around the retracting snare (with respect to the support assembly 100). As the slide 108 is advanced toward the distal end (to the left in Figure 6), pinion 120 rotates counterclockwise causing pinion 118 to rotate clockwise which drives sheath 60 to the right. At the same time, the wire 51 which is secured to the slide is moved distally (to the left).

In the embodiment of Figure 8, a third pinion 119 is mounted on the slide 108 in engagement with the pinions 118 and 120. Moreover, the sheath 60 is immovably secured to the distal end of the support assembly 100 so that, in this case, only the wire is movable. Because of the addition of the third gear, in the embodiment of Figure 8, the mounting cap 116 and the rod 51 move in the same direction as the movement of the slide 108 relative to the support assembly 100. In other words, if the user pulls the finger grip 110 towards the thumb hole 102, the three pinions 118, 119 and 120 also pull the rod 51 towards the thumb hole, i.e. towards the support assembly 100 which tends to pull the snare into the sheath 60. In this embodiment, as the slide 108 is advanced distally (to the right in Figure 8) pinion 120 rotates clockwise, pinion 119 rotates counterclockwise, and pinion 118 rotates clockwise, thus moving rack 116 and the wire 51 also in the distal direction (to the right). In other words, the wire moves in the direction of movement of the slide at a different rate.

Figure 9 is similar to Figure 8 in that the sheath 60 is immovably secured to the support assembly 100 but, in this case, the pinions 118 and 120 are coaxially mounted. Movement of the slide 108 distally (to the right) rotates both pinions 118 and 120 clockwise which again moves rack 116 in the distal direction (to the right), i.e. in the same direction of movement as the slide.

In the embodiments of Figures 8 and 9, as in the case of the embodiment of Figures 6 and 7, the relative size of the pinions determines the mechanical advantage of the instrument, i.e. the throw required to actuate the gripping device. It is contemplated that, with the embodiments of Figures 8 and 9, a mechanical advantage as high as four may be obtained, i.e. the throw required to actuate the gripping device will be one-fourth the actual movement of the gripping device relative to the sheath.

A surgical instrument in accordance with the invention may be made of any suitable material. It is contemplated that the device itself can be made disposable in which case both the support assembly 10 and the slide will be moulded from a suitable plastic such as polycarbonate or other inert plastic.

Claims

1. A surgical gripping instrument of the type including a sheath (60), gripping means (59) at the distal end of the sheath movable with respect to the sheath over a predetermined distance for actuating the gripping means, a support assembly (10, 100) and a slide (30, 108) movable with respect to the support assembly, the slide (30, 108) being connected to at least one of the sheath and the gripping means for relative movement between the sheath and the gripping means, characterised by means responsive to movement of the slide relative to the support assembly by a distance less than the predetermined distance for causing the gripping means to be moved relative to the sheath by the predetermined distance in order to actuate the gripping means.

2. A surgical instrument according to Claim 1, wherein the means responsive to movement comprises means for simultaneously moving the gripping means in one direction and the sheath in the opposite direction.

3. A surgical instrument according to Claim 2, wherein the means responsive to movement comprises means connecting the slide to the gripping means and a belt (80) connected to the sheath (60) and slide (30).

4. A surgical instrument according to Claim 1, wherein the means responsive to movement comprises rotatable gears (118, 120) mounted on the slide (108) and engaging the sheath (60) or the gripping means (59).

5. A surgical gripping instrument, comprising:

a support assembly (10, 100);

a slide (30, 108) mounted on the support assembly for relative movement with respect thereto;

a wire (53) movable with the slide relative to the support assembly;

gripping means (59) at the distal end of the wire;

a sheath (60) enveloping the wire, movement of the wire (53) a predetermined distance relative to the sheath causing the gripping means to be actuated by a predetermined amount; and characterised by

means enabling the slide to be moved a distance relative to the support assembly less than the predetermined distance to actuate the gripping means by the predetermined amount.

6. A surgical gripping instrument according to Claim 5, wherein the sheath (60) is movable relative to the support assembly (10, 100) and wherein the enabling means comprises means for moving the wire (53) in one direction and simultaneously moving the sheath (60) in the opposite direction.

7. A surgical gripping instrument according to Claim 6, wherein the wire (53) is secured to the slide (30), wherein the support assembly includes distal and proximal axles (16, 18) and wherein the enabling means comprises a belt (80) fixed at both ends to the slide (30), the belt (80) passing over both of the axles and secured to the sheath (60), whereby movement of the slide (30) in one direction causes rotation of the belt (80) and movement of the sheath (60) in the opposite direction.

8. A surgical gripping instrument according to Claim 5, wherein the sheath (60) is movable relative to the support assembly (100) and wherein the enabling means comprises gear means (118, 120, 122, 124) connected to the sheath (60) and support assembly (100) for moving the sheath (60) in a direction opposite the direction of movement of the slide (108) relative to the support assembly (100).

9. A surgical gripping instrument according to Claim 5, wherein the sheath (60) is fixed to the support assembly (100) wherein the wire (53) is movable relative to the slide (108), and wherein the enabling means comprises gear means (118, 120, 122, 124) for moving the wire (53) a distance relative to the support assembly (100) greater than the displacement of the slide (108) relative to the support assembly (100) as the slide (108) is moved.

10. A surgical gripping instrument according to Claim 9, wherein the gear means (118, 119, 120) causes the wire (53) to move in a direction opposite the direction of movement of the slide (108) relative to the support assembly (100). (Fig. 8)

11. A surgical gripping instrument according to Claim 9, wherein the gear means (116, 118, 120) causes the wire (53) to move in the same direction as the slide (108) relative to the support assembly (100). (Fig. 9)

Patentansprüche

1. Chirurgisches Greifinstrument, das eine Hülse (60), ein Greifmittel (59) am distalen Ende der Hülse, das gegenüber der Hülse über eine vorbestimmte Strecke beweglich ist, um die Greifmittel zu betätigen, eine Haltevorrichtung (10, 100) und einen Schlitten (30, 108) umfaßt, der gegenüber der Haltevorrichtung beweglich ist, wobei der Schlitten (30, 108) zumindest entweder mit der Hülse oder dem Greifmittel verbunden ist und dabei zur Relativbewegung zwischen der Hülse und dem Greifmittel dient,
dadurch gekennzeichnet,
daß es Mittel umfaßt, die auf eine Bewegung des Schlittens gegenüber der Haltevorrichtung reagieren, die kürzer ist als die vorbestimmte Strecke, um zu bewirken, daß das Greifmittel gegenüber der Hülse über die vorbestimmte Strecke bewegt wird, um das Greifmittel zu betätigen.

2. Chirurgisches Greifinstrument nach Anspruch 1,
dadurch gekennzeichnet,
daß die auf Bewegung reagierenden Mittel andere Mittel zum gleichzeitigen Bewegen des Greifmittels in eine Richtung und der Hülse in die entgegengesetzte Richtung umfassen.

3. Chirurgisches Greifinstrument nach Anspruch 2,
dadurch gekennzeichnet,
daß die auf Bewegung reagierenden Mittel andere Mittel, die den Schlitten mit dem Greifmittel verbinden und einen Riemen (80) umfassen, der mit der Hülse (60) und dem Schlitten (30) verbunden ist.

4. Chirurgisches Greifinstrument nach Anspruch 1,
dadurch gekennzeichnet,
daß die auf Bewegung reagierenden Mittel

drehbare Zahnräder (118, 120) umfassen, die auf dem Schlitten (108) montiert sind und entweder mit der Hülse (60) oder mit dem Greifmittel (59) im Eingriff stehen.

5. Chirurgisches Greifinstrument, umfassend
   - eine Haltevorrichtung (10, 100);
   - einen Schlitten (30, 108), der auf der Haltevorrichtung montiert ist und Relativbewegungen zu dieser ausführen kann;
   - einen Draht (53) der zusammen mit dem Schlitten gegenüber der Haltevorrichtung beweglich ist;
   - Greifmittel (59) am distalen Ende des Drahtes;
   - eine Hülse (60), die den Draht umhüllt, wobei eine Bewegung des Drahtes (53) über eine vorbestimmte Strecke gegenüber der Hülse eine Betätigung der Greifmittel um den vorbestimmten Weg bewirkt;

   dadurch gekennzeichnet,
   daß Antriebsmittel bewirken, daß der Schlitten über eine kleinere Strecke als die vorbestimmte Strecke gegenüber der Haltevorrichtung bewegt werden kann, um das Greifmittel um den vorbestimmten Weg zu betätigen.

6. Chirurgisches Greifinstrument nach Anspruch 5,
   dadurch gekennzeichnet,
   daß die Hülse (60) gegenüber der Haltevorrichtung (10, 100) beweglich ist und daß die Antriebsmittel andere Mittel zum Bewegen des Drahtes (53) in eine Richtung bei gleichzeitiger Bewegung der Hülse (60) in die entgegengesetzte Richtung umfassen.

7. Chirurgisches Greifinstrument nach Anspruch 6,
   dadurch gekennzeichnet,
   daß der Draht (53) am Schlitten (30) befestigt ist, daß die Haltevorrichtung distale und proximale Achsen (16, 18) aufweist, und daß die Antriebsmittel einen Riemen (80) umfassen, der an beiden Enden des Schlittens (30) befestigt ist, wobei der Riemen (80) über beide Achsen hinüber erstreckt und an der Hülse (60) gesichert ist, wodurch die Bewegung des Schlittens (30) in eine Richtung die Rotation des Riemens (80) verursacht und in die entgegengesetzte Richtung die Bewegung der Hülse (60) bewirkt.

8. Chirurgisches Greifinstrument nach Anspruch 5,
   dadurch gekennzeichnet,
   daß die Hülse (60) gegenüber der Haltevorrichtung (100) beweglich ist und daß die Antriebsmittel Zahnradmittel (118, 120, 122, 124) umfassen, die mit der Hülse (60) und der Haltevorrichtung verbunden sind, um die Hülse in eine Richtung zu bewegen, die der Bewegungsrichtung des Schlittens (108) entgegengesetzt ist.

9. Chirurgisches Greifinstrument nach Anspruch 5,
   dadurch gekennzeichnet,
   daß die Hülse (60) an der Haltevorrichtung (100) befestigt ist, daß der Draht (53) gegenüber dem Schlitten (108) beweglich ist, und daß die Antriebsmittel Zahnradmittel (118, 120, 122, 124) umfassen, um den Draht (53) über eine Strecke gegenüber der Haltevorrichtung (100) zu bewegen, die größer ist als die Verschiebung des Schlittens (108) gegenüber der Haltevorrichtung (100), wenn der Schlitten (108) bewegt wird.

10. Chirurgisches Greifinstrument nach Anspruch 9,
    dadurch gekennzeichnet,
    daß die Zahnradmittel (118, 119, 120) den Draht (53) in eine Richtung bewegen, die der Bewegungsrichtung des Schlittens (108), der sich gegenüber der Haltevorrichtung (100) bewegt, entgegengesetzt ist. (Fig. 8)

11. Chirurgisches Greifinstrument nach Anspruch 9,
    dadurch gekennzeichnet,
    daß die Zahnradmittel (116, 118, 120) eine Bewegung des Drahtes (53) in die gleiche Richtung bewirken, in die sich der Schlitten (108) gegenüber der Haltevorrichtung (100) bewegt. (Fig. 9)

Revendications

1. Instrument de préhension chirurgicale, du type comprenant une gaine (60) , des moyens de préhension (59) placés à l'extrémité distale de la gaine et déplaçables par rapport à celle-ci , sur une distance prédéterminée, en vue d'actionner ces moyens de préhension, un ensemble de support (10, 100) et un coulisseau (30, 108) déplaçable par rapport à l'ensemble de support, le coulisseau (30, 108) étant relié à au moins l'un des éléments parmi la gaine et les moyens de préhension, en vue d' effectuer un déplacement relatif entre la gaine et le moyen de préhension, caractérisé par des moyens, réagissant au déplacement du coulisseau par rapport à l'ensemble de support, d'une distance inférieure à la distance prédéterminée, en

vue de déplacer le moyen de préhension par rapport à la gaine, de la distance prédéterminée, pour actionner ces moyens de préhension.

2. Instrument chirurgical selon la revendication 1, dans lequel les moyens réagissant aux déplacements comprennent un moyen pour opérer simultanément un déplacement des moyens de préhension dans une direction et déplacer la gaine dans la direction opposée.

3. Instrument chirurgical selon la revendication 2, dans lequel les moyens réagissant aux déplacements comprennent un moyen reliant le coulisse au moyen de préhension et une courroie (80) reliée à la gaine (60) et au coulisseau (30).

4. Instrument chirurgical selon la revendication 1, dans lequel les moyens réagissant aux déplacements comprennent des pignons rotatifs (118, 120), montés sur le coulisseau (108) et placés en contact avec la gaine (60) ou les moyens de préhension (59).

5. Instrument de préhension chirurgical comprenant :
un ensemble de support (10, 100);
un coulisseau (30, 108) monté sur l'ensemble de support pour permettre un déplacement relatif par rapport à celui-ci;
un câble (53) déplaçable avec le coulisseau par rapport à l'ensemble de support;
des moyens de préhension (59) placés à l'extrémité distale du câble ;
une gaine (60) enveloppant le câble, le déplacement du câble (53) sur une distance prédéterminée par rapport à la gaine provoquant l'actionnement des moyens de préhension, d'une distance prédéterminée; et
caractérisé par
des moyens autorisant le coulisseau à se déplacer d'une distance relative par rapport à l'ensemble de support inférieure à la distance prédéterminée pour actionner les moyens de préhension de la valeur prédéterminée.

6. Instrument de préhension chirurgical selon la revendication 5, dans lequel la gaine (60) est déplaçable par rapport à l'ensemble de support (10, 100) et dans lequel les moyens d'autorisation comprennent un moyen destiné à produire le déplacement du câble (53) dans une direction et à simultanément déplacer la gaine (60) dans la direction opposée.

7. Instrument de préhension chirurgical selon la revendication 6, dans lequel le câble (53) est fixé au coulisseau (30), dans lequel l'ensemble de support comprend des tiges d'axe distale et proximale (16, 18) et dans lequel les moyens d'autorisation comprennent une courroie (80) fixée au coulisseau (30), la courroie (80) passant sur les deux tiges et étant fixée à la gaine (60), de manière qu'un déplacement du coulisseau (30) dans une direction provoque la rotation de la courroie (40) et le déplacement de la gaine (60) dans la direction opposée.

8. Instrument de préhension chirurgical selon la revendication 5, dans lequel la gaine (60) est déplaçable par rapport à l'ensemble de support (100) et dans lequel les moyens d'autorisation comprennent des moyens d'engrenage (118, 120, 122, 124), reliés à la gaine (60) et à l'ensemble de support (100), pour produire le déplacement de la gaine (60) dans une direction opposée à la direction du déplacement du coulisseau (108) par rapport à l'ensemble de support (100).

9. Instrument de préhension chirurgical selon la revendication 5, dans lequel la gaine (60) est fixée sur l'ensemble de support (100), dans lequel le câble (53) est déplaçable par rapport au coulisseau (108) et dans lequel les moyens d'autorisation comprennent des moyens d'engrenage (118, 120, 122, 124) destinés à déplacer le câble (53) par rapport à l'ensemble de support (100) d'une distance relative supérieure au déplacement du coulisseau (108) par rapport à l'ensemble de support (100), lorsque le coulisseau (108) est déplacé.

10. Instrument de préhension chirurgical selon la revendication 9, dans lequel les moyens d'engrenage (118, 119, 120) provoquent le déplacement du câble (103) dans une direction opposée à la direction du déplacement du coulisseau (108) par rapport à l'ensemble de support (100) (figure 8).

11. Instrument de préhension chirurgical selon la revendication 9, dans lequel les moyens d'engrenage (116, 118, 120) provoquent le déplacement du câble (103) dans la même direction que le coulisseau (108) par rapport à l'ensemble de support (100). (figure 9)

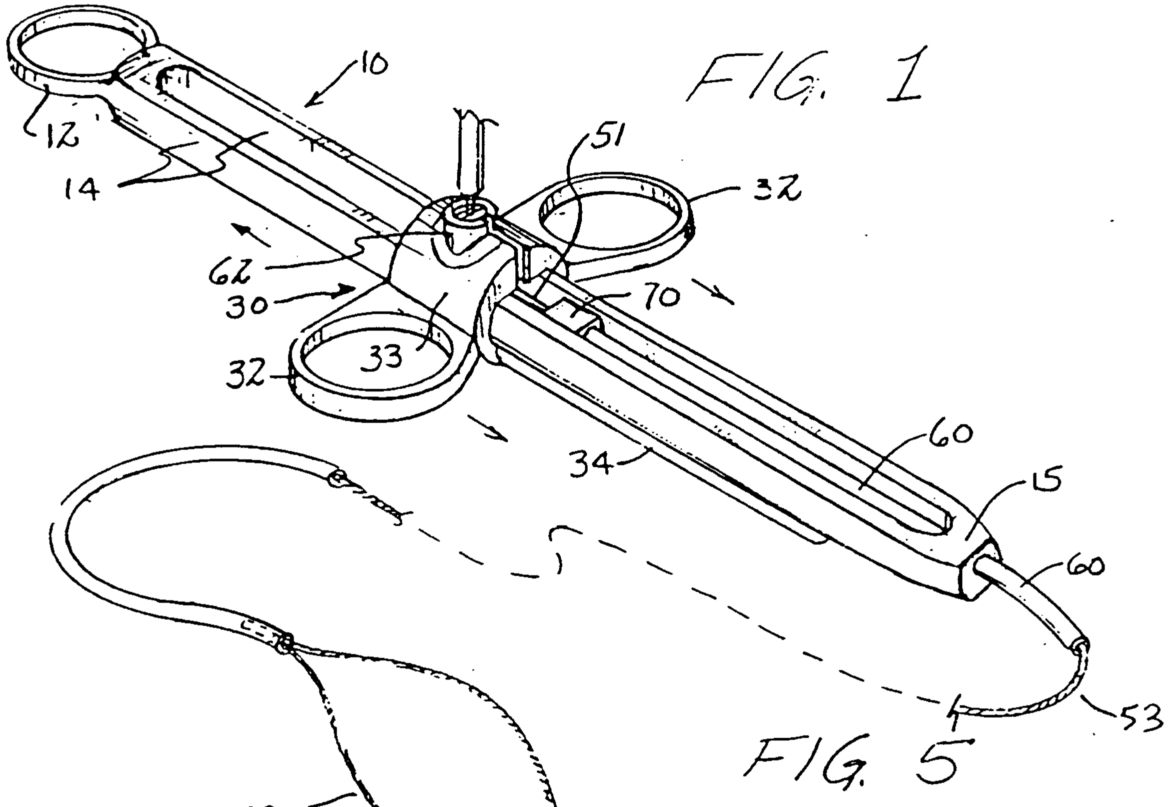
FIG. 1

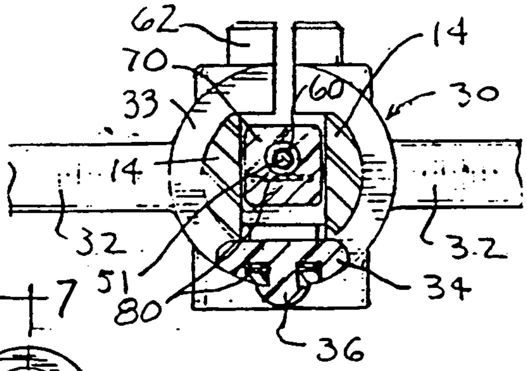
FIG. 5

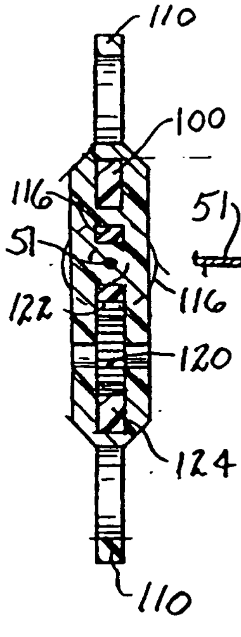
FIG. 7

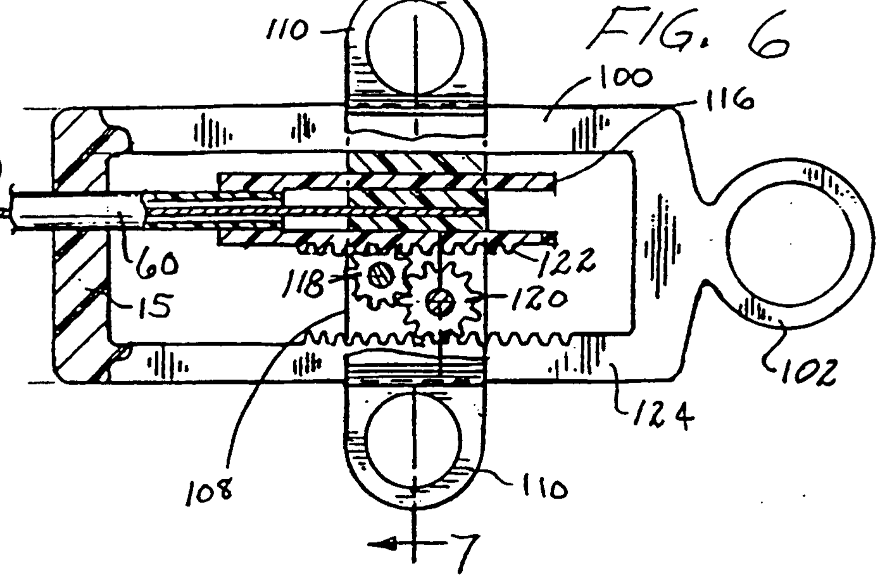
FIG. 6

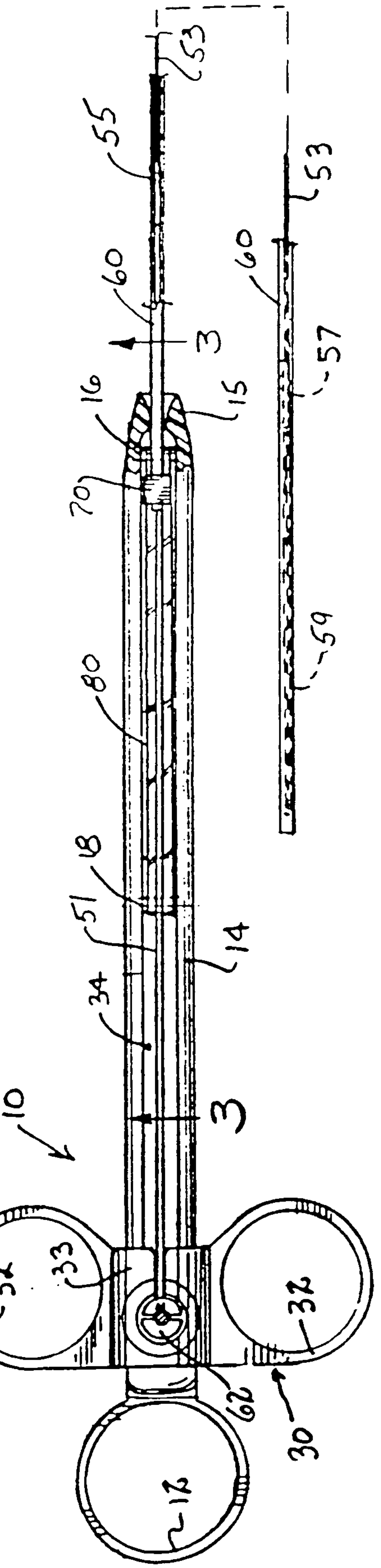
FIG. 2

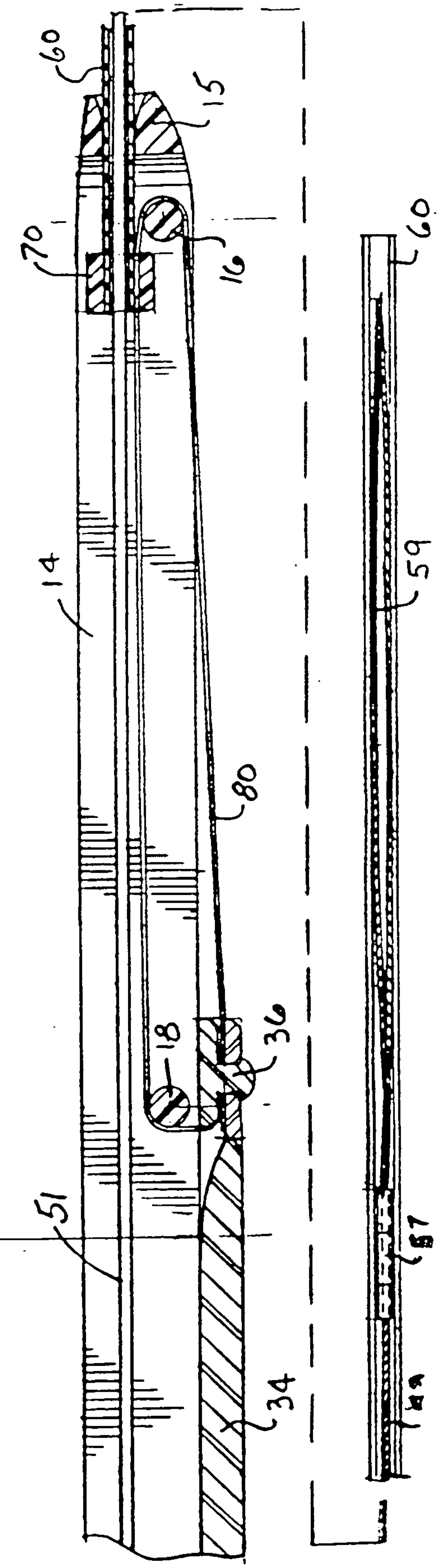
FIG. 3

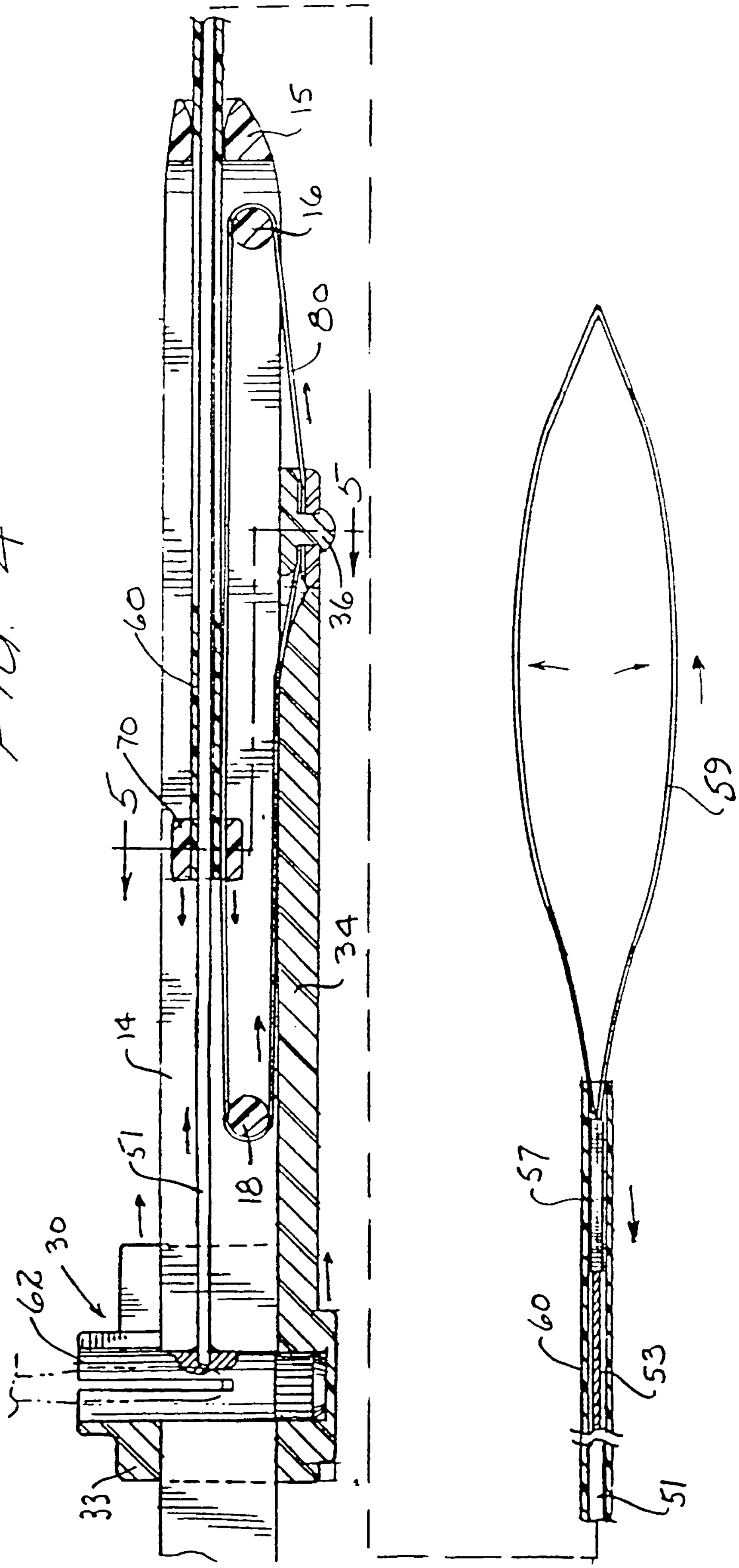

FIG. 4

FIG. 8

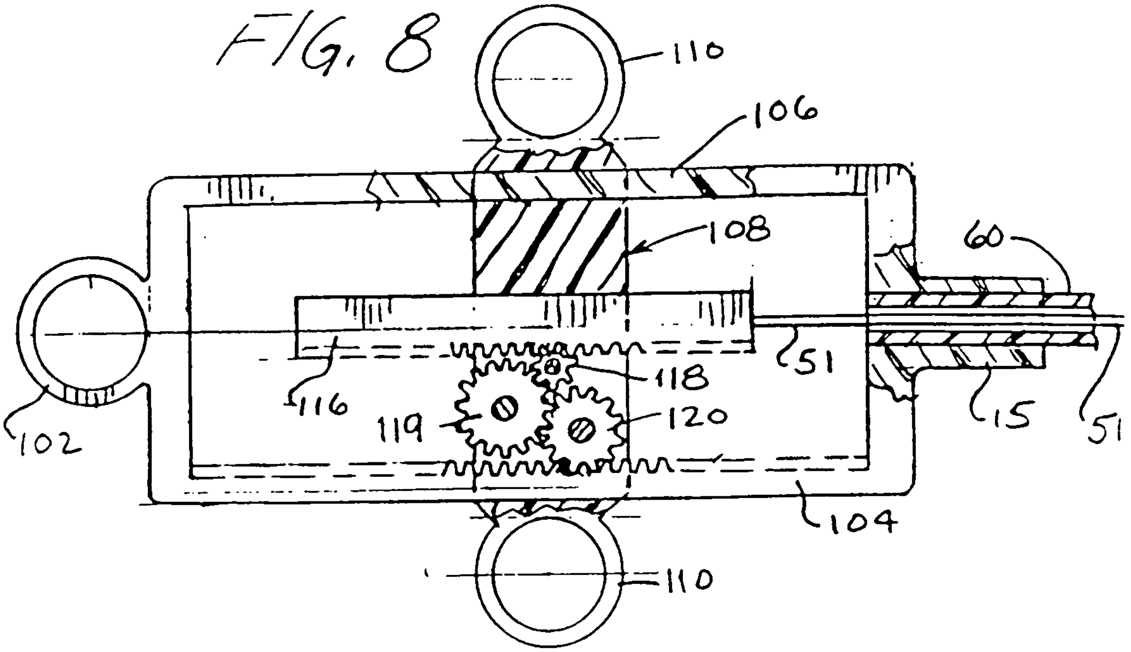
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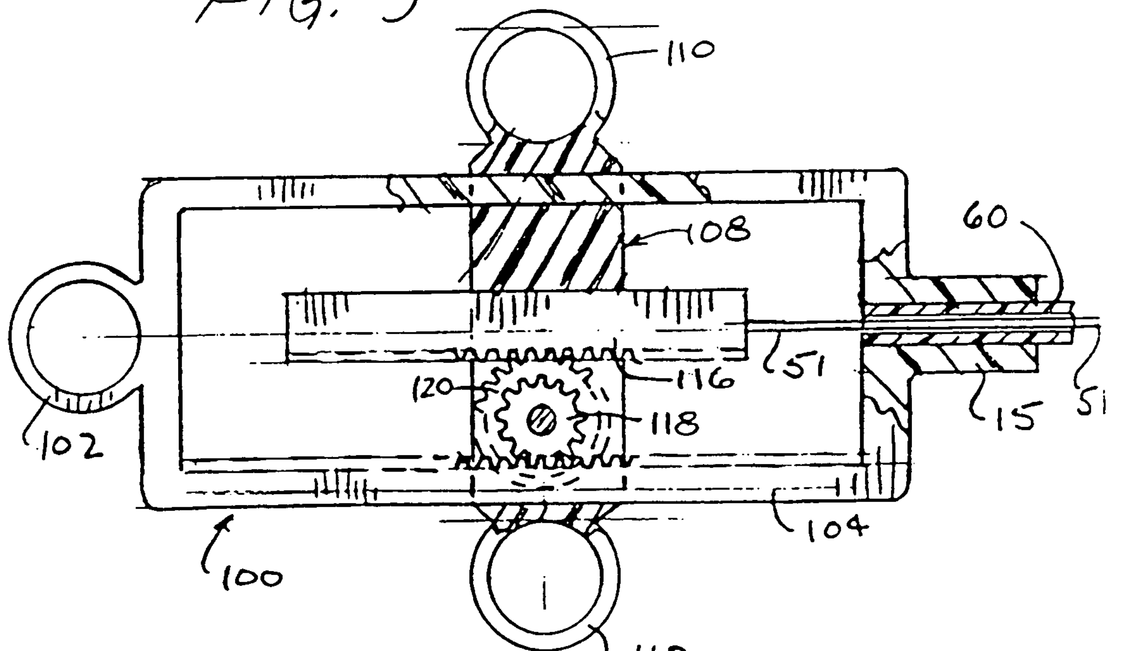
FIG. 9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